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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/621,465	**Applicant(s)** FUNATO, HIROYOSHI	
	Examiner Audrey Y. Chang	**Art Unit** 2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _25 March 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _30,32-44,46 and 48-53_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _30, 32-44, 46, 48-53_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on March 25, 2008, which has been entered into the file.
- By this amendment, the applicant has amended claims 50-52 and has newly added claim 53.
- Claims 30, 32-44, 46, and 48-53 remain pending in this application.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 30 and 50-51 and newly added claim 53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The previously added claims 50-51 recite that the uni-directionally stretched birefringence layer is patterned by forming the photoresist and mask on the layer before attaching to the transparent substrate, however its based claim 30 recite that the layer is patterned after the layer is attached to the transparent substrate. The scopes of the claims therefore are unclear.

The phrase "forming said mask on said photoresist" recited in newly added claim 53 is confusing since it is not clear what does it mean by *forming* mask "on" the photoresist. How to form the mask? Also the phrase "removing said photoresist and said metallic layer on said photoresist" recited in claim 53 is confusing since it is not clear how to remove something formed itself?

This rejection has been set forth in the previous Office Action.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 30, 32 35-42 and 50-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over to Takeda et al (PN. 5,739,952) in view of the patent issued to Nakamura et al (PN. 5,244,713), Takeda et al (PN. 5,793,733).

Takeda et al ('952) teaches a *polarization beam splitter* that is comprised of a *holographic grating pattern* (Figures 1-4) formed with *birefringence film* (2) laying on a *transparent substrate* (1). The birefringence layer (2) has an anisotropic property such that the *refractive indices* (n_o and n_e) of the layer for light propagates in the *ordinary* direction (S-polarization direction) and *extraordinary* direction (P-polarization direction) are different from each other. This difference in refractive indices will make the holographic grating imparting *different* phase value to the S-polarization and P-polarization components of an incident light which therefore will diffract the two components of light differently.

Takeda et al teaches that the holographic grating pattern of the polarization beam splitter is formed by first *depositing* a monomeric diacetylene film (i.e. an organic polymer film) on a *substrate* and then polymerized it to form a polymer of diacetylene, which is an *organic polymer material.* The polymer material is then *rubbed* in *one direction to form the birefringence layer*. Takeda et al further teaches that a *resist* for forming a grating is applied on top of the polydiacetylene film to *form the grating pattern* in the film, (please see columns 8-9). The grating pattern is holographic because Takeda et al

teaches explicitly that the grating may also be formed by two-beam interference method, (please see column 9, lines 1-5).

This reference has met all the limitations of the claims with the exception that although it teaches that polymer film is *rubbed* in one direction but it does not teach explicitly that the polymer film is uni-directionally stretched and heated to form the birefringence film. However rubbing in one direction has the essentially the same effect as uni-directional stretching and furthermore using uni-directional stretching and heating process to form birefringence film from an *organic polymer* film is rather well known in the art as demonstrated by the teachings of **Nakamura** et al wherein an *organic polymer film* is **heat treated and then uniaxially stretched, (i.e. uni-directionally stretched)** to make the film have *optimum* birefringence, (please see column 4, lines 6-26). Nakamura et al teaches that polymer materials that can be made birefringence by heat treatment and stretching method include *polycarbonates, polystyrene and polyamide resins*, (please see column 2, lines 53-69). It would then have been obvious to one skilled in the art to use the well-known heating and uniaxial stretching method and the well known *organic polymer* materials as an alternative materials and method to make the *birefringence* film that can be used as the birefringence layer for the holographic grating of Takeda et al for the benefit of using a manufacture method to obtain *optimum* birefringence of the film, and to cut manufacture cost by using conventionally accessible and known polymer materials.

Although these references do not teach explicitly that the organic polymer film is applied on a substrate and then removed from the substrate and do not teach, the birefringence film is reattached to the substrate via an *adhesive* layer however such processes have to be either inherently met by the disclosures of Takeda et al or disclosure of Nakamura et al in the step of forming the organic polymer film before the heating and stretching treatment steps and in the step of adhering the birefringence film to the substrate or obvious modifications to one skilled in the art since the organic polymer film has to be **first** formed on some substrate and the substrate cannot be included in the heating and stretching steps for it will interrupt

such treatments for the film to make the birefringence film. Furthermore, whether to use an adhesive layer to attach the birefringence film layer to the substrate or not really provides no patentable distinction since the final result, namely having the birefringence film layer *attached* to the substrate, is achieved by the disclosure of Takeda et al. Also Takeda et al specifically teaches that equally good result will be achieved by either having an adhesive layer between of the birefringence layer and the substrate or not having one, (please see column 27, lines 10-15). Such modification therefore is considered as obvious matters of design choice to one skilled in the art for making the adhesion between the two by desired manner.

With regard to the feature concerning the periodic grating pattern formed by placing photo-resist and mask, this reference does not teach such explicitly. Takeda et al ('952) teaches that the periodic grating is formed by using two beams interference method but does not teach explicitly that it is formed by using photo-resist mask. However using photo-resist layer with a mask to form periodic grating pattern is a standard method in the art as demonstrated by the teachings of **Takeda** et al ('733), wherein a polarization grating is formed by placing a photo-mask (14) formed in a photo-resisting material and placing such photo-mask over the birefringence layer (12) and using UV irradiation to form the periodic grating pattern, (please see Figures (2a) to 2(c), column 5, lines 5-23). The photo-mask (14) has to be formed in a photo-resist material in order for it to stand the high photo energy of the UV beam. It is implicitly true that the substrate (11, figures 2(a) to 2(c)) ***remains unpatterned.*** It would then have been obvious to one skilled in the art to apply the teachings of Takeda et al ('733) as an alternative means for forming the desired grating pattern in the birefringence layer for the benefit of perhaps providing the capability of mass producing such holograms by using a standard photo-mask.

With regard to the feature concerning receiving a light beam, Takeda et al ('952) and Takeda et al ('733) **both** teach that the polarization hologram is capable of diffracting light beam based on its

polarization and wavelength, such is a direct result of the diffraction equations stated in equations such as 26 and 28.

Claim 30 includes the feature that the transparent substrate remains unpatterned. Takeda et al ('952) teaches explicitly that the substrate remains **unpatterned** wherein the diffraction grating is formed in the birefringent film (2, Figure 4) only. Takeda et al ('733) also teaches that the substrate remains **unpatterned**, (please see Figure 2(c)).

Claim 30 has been amended to include the feature of forming an isotropic overcoat layer to enclose the birefringent layer. Takeda et al ('952) in a different embodiment teaches that an isotropic layer (20, Figure 12) can be formed over the grating patterned birefringence film (2) to enclose the birefringence layer.

With regard to claim 32, Nakamura et al reference teaches that the suitable polymers that can be heat stretched to form birefringence film includes polycarbonate, polystyrene and polyamide film, (please column 2, lines 53-69). The modification would have been obvious to one skilled in the art since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claim 35, Nakamura et al teaches that the heat stretching process is done at a temperature between 190 to 230 ^{0}C. Although it does not teach explicitly that it is heated at 350 ^{0}C but such feature is considered to be obvious modification since at either temperature the same result namely heating the organic polymer film in the processes of forming it a birefringence film is achieved.

With regard to claims 37-39, these references teach many different examples of birefringence film with different refractive index in the ordinary and extraordinary direction, however they do not teach explicitly to have the particular values claimed in the claims. But such modification is considered to be obvious matters of design choices to one skilled in the art to make the birefringence film with desired

refractive indices so that the polarization beam splitter with the holographic grating pattern will behave as desired.

With regard to claims 40 and 41, Takeda et al teaches that the **optical path phase difference** for the ordinary and extraordinary light paths for the grating patterned birefringence film with the grooves of the grating pattern formed with isotropic material are denoted by equations 26 and 28, i.e.

$OPD\ (o) = (n_o - n_c)*\ d2*k$, $OPD(e) = (n_e - n_c)*\ d2*k$,

Wherein n_o and n_e are the refractive indices of the birefringence film for the ordinary and extraordinary direction and n_c is the refractive index of the isotropic layer and d2 is the grating height and k is $2\pi/\lambda$, λ being the wavelength, (k is **typographically wrong** as stated in column 14 line 3 but it should be defined as $2\pi/\lambda$, as in columns 6, line 33, column 22, line 61 etc. in order to keep the equations dimensionally correct). Takeda et al teaches that in order for the ordinary light or the extraordinary light to be not diffracted by the grating the **optical path phase difference** has to be an even multiple of π, i.e. $2m\pi$, and in order for them to be diffracted the **optical path phase difference** has to be an odd multiple of π, i.e. $(2m+1)\pi$. Takeda et al teaches that the beam splitter including the holographic grating is designed to totally diffract one component of the beam and leaves the other not diffracted, (please see column 7, lines 18-24). This then requires one of the optical path difference equals $2m\pi$ and the other equals $(2m+1)\pi$. This then gives the following results:

$OPD(o) = 2m\pi = (n_o - n_c)*\ d2*k$, which gives $(n_o - n_c)\ d2 = m\ \lambda$, and

$OPD\ (e)= (2m+1)\pi = (n_e - n_c)*\ d2*k$, which gives $(n_e - n_c)*\ d2 = (2m+1)\ \lambda$,

Or,

$OPD(o) = (2m+1)\pi = (n_o - n_c)*\ d2*k$, which gives $(n_o - n_c)\ d2 = (2m+1)\ \lambda$, and

$OPD\ (e)= 2m\pi = (n_e - n_c)*\ d2*k$, which gives $(n_e - n_c)*\ d2 = m\ \lambda$.

With regard to claim 42, these references do not teach explicitly to use spin coating for applying the organic polymer to the substrate, however such process is extremely well known in the art, such

modification would have been obvious to one skilled in the art as an alternative means to apply the polymeric film on the substrate. The isotropic layer can be an overcoat layer (20) as shown in Figure 12.

With regard to the newly added claims 50 and 51, the references do not teach explicitly that the birefringence layer is patterned *before* being attached to the substrate and the photoresist and mask are formed on the layer before the layer being attached to the substrate. These features are contradicting to their based claim. These features are really cannot be examined here, (since they are contracting to its based claim which makes the scopes unclear).

With regard to amended claim 52, these references do not teach that the substrate for preparing the layer and for patterned the layer are the not the same, however to it is obvious to one skilled in the art to use different substrate to pattern the birefringent layer and to form the hologram if one chooses to patterning the birefringent layer separately. This really provides no novel difference.

5. Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Takeda et al ('952) and Nakamura et al and Takeda et al ('733) as applied to claim 30 above, and further in view of the patent issued to Yoshimi et al (PN.5,245,456) and Yamamoto et al (PN. 6,040,418).

The polarization beam splitter comprises a holographic grating taught by **Takeda** et al in combined with the teachings of **Nakamura** et al as and Takeda et al ('733) described for claim 30 above have met all the limitations of the claims. These references however do not teach explicitly that the organic polymer material comprises polyimide and the polyimide film is obtained with the claimed acid and solvent solution. **Yoshimi** et al in the same field of endeavor teaches that polyimide resin shows positive birefringence which is then a suitable birefringence polymer material. **Yamamoto** et al in the same field of endeavor teaches that it is standard knowledge in the art to prepare polyimides using polyamide acid with solvent, (please see columns 1 and 2). It would then have been obvious to one

skilled in the art to apply the teachings if Yoshimi et al and Yamamoto et al to prepare polyimide film as an alternative suitable polymer material for the birefringence film. Since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

6. **Claims 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al (PN. 5,739,952) in view of the patent issued to Nakamura et al (PN. 5,244,713).**

Takeda et al teaches a *polarization beam splitter* that is comprised of a *holographic grating pattern* (Figures 1-3) formed with *birefringence film* (2) laying on a *substrate* (1). The birefringence layer (2) has an anisotropic property such that the *refractive indices* (n_o and n_e) of the layer for light propagates in the *ordinary* direction (S-polarization direction) and *extraordinary* direction (P-polarization direction) are different from each other. This difference in refractive indices will make the holographic grating imparting *different* phase value to the S-polarization and P-polarization components of an incident light which therefore will diffract the two components of light differently.

This reference has met all the limitations of the claims with the exception that although it teaches that the birefringence film comprises an organic polymer film is *rubbed* in one direction but it does not teach *explicitly* that it is uni-directionally stretched birefringence film. However using uni-directional stretching and heating process to form birefringence film from an *organic polymer* film is rather well known in the art as demonstrated by the teachings of **Nakamura** et al wherein an *organic polymer film* is **heat treated and then uniaxially stretched, (i.e. uni-directionally stretched)** to make the film have *optimum* birefringence, (please see column 4, lines 6-26). It would then have been obvious to one skilled in the art to use the well-known heating and uniaxial stretching method and the well known *organic polymer* materials as alternative materials and method to make the birefringence film to be used as the birefringence layer for the holographic grating of Takeda et al for the benefit of using a

manufacture method to obtain *optimum* birefringence of the film, and to cut manufacture cost by using a conventionally accessible and known polymer materials.

With regard to the feature having the depth of the grating is essentially equal to a thickness of the birefringence layer. This is corresponding to the situation of making the thickness of d3 being zero as in equations (22 and 23, to Figure 4) of Takeda et al ('952). Such modification would certainly have been obvious to one skilled in the art for the benefit of making the polarization grating with less material and therefore less cost. Furthermore, it has been held when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involve only routine skill in the art. In re Aller, 105 USPQ 233.

Claim 43 has been amended to include the feature of "*a substantially planar* substrate". Takeda et al teaches explicitly that the substrate is substantially planar as shown in Figures 4, 9(a) and 9(b)).

With regard to claim 44, in a different embodiment Takeda et al teaches that an isotropic layer (20, Figure 12) can be formed over the grating patterned birefringence film (2) to enclose the birefringence layer.

7. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Takeda et al and Nakamura et al as applied to claim 43 above, and further in view of the patent issue to Iwatsuka et al (PN. 5,245,471).

The polarization beam splitter including the holographic grating taught by **Takeda** et al in combination with the teachings of **Nakamura** et al as described for claim 43 above have met all the limitations of the claims. These references however do not teach to have the features of having a second substrate formed with an adhesive layer as the isotropic layer. **Iwatsuka** et al in the same field of endeavor teaches a polarizer including grating pattern formed in birefringence layer wherein a second substrate (19, Figure 6E) is formed on top of an adhesive layer (18) serves as the isotropic layer that fills

the grooves of the grating patterned birefringence layer (4). It would then have been obvious to one skilled in the art to apply the teachings of Iwatsuka et al to modify the design of the beam splitter of Takeda et al accordingly for the benefit of providing the polarization beam splitter with easy handling.

8. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Iwatsuka et al (PN. 5,245,471) in view of the patent issued to Nakamura et al .

Iwatsuka et al teaches a method for forming a polarization hologram that is comprised of the step of providing a *substrate* (1) and forming a *birefringence layer* (2) over the substrate. The method further comprises the step of forming a *photo-resist mask* (3) over the birefringence layer and forming a *periodic grating pattern* on the birefringence film without etching the substrate. The method then comprises the step of *removing* the photo-mask and forming an *isotropic* layer (4, 9 , 11 or 18) over the patterned birefringence layer, (please see Figures 1, 2(A) to 2(E) and 6(A) to 6(E)).

This reference has met all the limitations of the claim with the exception that it does not teach explicitly that the birefringence layer is an uni-directional stretched organic polymer layer. However birefringence layer formed by uniaxially stretching organic polymer layer is very well known in the art as demonstrated by the teachings of **Nakamura** et al wherein an *organic polymer film* is *heat treated and then uniaxially stretched, (i.e. uni-directionally stretched)* to make the film have *optimum* birefringence, (please see column 4, lines 6-26). It would then have been obvious to one skilled in the art to apply the teachings of **Nakamura** et al to use a birefringence layer that is comprised of an uniaxially stretched polymer layer for the benefit of allowing different materials being used to form the polarization grating and at same time using a birefringence layer that is made to have *optimized* birefringence which is essential for the function of the polarization hologram.

With regard to the formula for designing the polarization hologram, as recited in claim 48, Iwatsuka et al teaches such formula explicitly. Iwatsuka et al teaches that if the isotropic layer (11) has

refractive index of (n2) and the birefringent layer (10) has refractive index for one polarization, which may be p-polarization, is (n1+) and for the other polarization, which may be s-polarization, is (n1-) and the thickness of the grating pattern of the polarization hologram is "d" then the following equations holds:

$[(n1+) -(n2)]*d = N1* L$ and $[(n1-) - (n2)] *d =(N2+1/2)* L$, (L being the wavelength), (pleas see columns 4-5).

With regard to claim 49, the periodic grating pattern has different refractive indices for two orthogonal polarization direction, in the birefringent region (2).

With regard to the feature "a top surface portion of the substrate is not covered by the uni-directionally stretched organic polymer layer" and the isotropic overcoat is "over the patterned stretched organic polymer layer and directly contacting the top surface", **Iwatsuka** et al teaches **explicitly** that the polarization hologram is formed by using a photo-resist mask (3) on a birefringent film (2), which is the organic polymer layer, that is on top surface portion of the substrate (1). After the photo-resist photomask is removed, an *isotropic adhesive layer* (18, Figure 6(E)) serves as the *isotropic overcoat* covers both the birefringent diffraction pattern (4) and the exposed top portion of the substrate, (please see Figure 6(E)). And as shown in Figure 6(E) a top portion of the substrate is not covered by the organic polymer or the birefringent film (2) and the isotropic overcoat (3) also is directly contacting the top substrate at the portion that is not covered by the birefringent film.

9. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Iwatsuka et al (PN. 5,245,471) in view of the patents issued to Nakamura et al and Yoshimi et al (PN.5,245,456) .

Iwatsuka et al teaches a method for forming a polarization hologram that is comprised of the step of providing a *substrate* (1) and forming a *birefringence layer* (2) over the substrate. The method further comprises the step of forming a *photo-resist mask* (3) over the birefringence layer and forming a *periodic*

grating pattern on the birefringence film without etching the substrate. The method then comprises the step of *removing* the photo-mask and forming an *isotropic* layer (4, 9 , 11 or 18) over the patterned birefringence layer, (please see Figures 1, 2(A) to 2(E) and 6(A) to 6(E)).

This reference has met all the limitations of the claim with the exception that it does not teach explicitly that the birefringence layer is an uni-directional stretched organic polymer layer. However birefringence layer formed by uniaxially stretching organic polymer layer is very well known in the art as demonstrated by the teachings of **Nakamura** et al wherein an *organic polymer film* is *heat treated and then uniaxially stretched, (i.e. uni-directionally stretched)* to make the film have *optimum* birefringence, (please see column 4, lines 6-26). It would then have been obvious to one skilled in the art to apply the teachings of **Nakamura** et al to use a birefringence layer that is comprised of an uniaxially stretched polymer layer for the benefit of allowing different materials being used to form the polarization grating and at same time using a birefringence layer that is made to have *optimized* birefringence which is essential for the function of the polarization hologram.

With regard to the formula for designing the polarization hologram, as recited in claim 48, Iwatsuka et al teaches such formula explicitly. Iwatsuka et al teaches that if the isotropic layer (11) has refractive index of (n2) and the birefringent layer (10) has refractive index for one polarization, which may be p-polarization, is (n1+) and for the other polarization, which may be s-polarization, is (n1-) and the thickness of the grating pattern of the polarization hologram is "d" then the following equations holds:

[(n1+) -(n2)]*d = N1* L and [(n1-) - (n2)] *d =(N2+1/2)* L, (L being the wavelength), (pleas see columns 4-5).

With regard to claim 49, the periodic grating pattern has different refractive indices for two orthogonal polarization direction, in the birefringent region (2).

Claim 49 has been amended to include the feature that the uni-directionally stretched layer is a polyimide to form the birefringent layer. Iwatsuka et al teaches that the birefringent film is a dielectric

film. Nakamura et al teaches that stretched resin polymers such as polycarbonate (please see column 3, lines 13-19) can be used as the birefringent layer. But they do not teach explicitly to use polyimide layer. **Yoshimi** et al in the same field of endeavor teaches that the birefringent film can also be provided by heat and stretched *polyimide film or polycarbonate film*, (please see column 3, lines 49-54). It would then have been obvious to one skilled in the art to apply the teachings to use the desired layer material to as the birefringent layer to make the polarization grating for the purpose of fulfilling the specific requirements of particular application.

With regard to the feature "a top surface portion of the substrate is not covered by the uni-directionally stretched organic polymer layer" and the isotropic overcoat is "over the patterned stretched organic polymer layer and directly contacting the top surface", **Iwatsuka** et al teaches **explicitly** that the polarization hologram is formed by using a photo-resist mask (3) on a birefringent film (2), which is the organic polymer layer, that is on top surface portion of the substrate (1). After the photo-resist photomask is removed, an *isotropic adhesive layer* (18, Figure 6(E)) serves as the *isotropic overcoat* covers both the birefringent diffraction pattern (4) and the exposed top portion of the substrate, (please see Figure 6(E)). And as shown in Figure 6(E) a top portion of the substrate is not covered by the organic polymer or the birefringent film (2) and the isotropic overcoat (3) also is directly contacting the top substrate at the portion that is not covered by the birefringent film.

10. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Takeda et al (PN. 5,739,952), Nakamura et al (PN. 5,244,713) and Takeda et al (PN. 5,793,733) as applied to claim 30 above, and further in view of the patent issued to Ohguri (PN. 5,225,039).

The polarization beam splitter comprises a holographic grating taught by **Takeda** et al in combined with the teachings of **Nakamura** et al as and **Takeda et al ('733)** described for claim 30 above have met all the limitations of the claims.

Takeda et al teaches that a photomask with the grating pattern formed within is formed on the birefringent layer wherein the grating potion is then formed in the birefringent layer however this reference does not teach explicitly about using the mask and metallic layer to pattern as explicitly stated in the claim. However using photoresist mask and using metal reverse mask to patterning grating is well known in the art as taught by Ohguri. **Ohguri** teaches that a *photoresist* layer (62, Figure 6A) is formed on a layer material for patterning (61) wherein a mask having periodic grating pattern is formed in the photoresist layer (i.e. mask 63, Figure 6B). Ohguri then teaches to form a *reverse* mask layer (64) by depositing *metal* titanium layer on the photoresist mask layer (63) and on the layer material (61, Figure 6C). The portions of the photoresist layer (63) **covered** by the metal layer (64) as shown in Figure 6J are removed to allow **only** the metallic reverse mask layer (64) formed on the material layer (61) as shown in Figure 6K. Then the portions of the material layer (61) not covered by the metallic reverse mask (Figure 6L) is removed by etching and finally removing the unnecessary metallic reverse mask layer (64) to form the grating in the material (61, please see Figure 6M, column 5, line 7 to column 7 line 33). It would then have been obvious to one skilled in the art to apply the teachings of Ohguri to modify the grating patterning process for the benefit of using photoresist mask and reverse metal mask to make the grating with desired phase shift.

Double Patenting

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 43-44 and 46 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,618,344.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claimed a polarization hologram with grating pattern formed in a birefringence layer such that the birefringence layer is a stretched organic polymer film. The feature concerning the birefringence layer being *uni-directionally stretched* as recited in claim 43 of instant application does not differentiate the instant application from the cited patent since birefringent layer comprises uni-directional stretched or uniaxially stretched polymer film is very well known and standard in the art. And it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Response to Arguments

13. Applicant's arguments filed on March 25, 2008 have been fully considered but they are not persuasive.

14. In response to applicant's arguments concerning the combining the teachings of Nakamura of "stretching and heating" the polymer layer to the "merely rubbing" of the layer of Takeda ('952) would not improve the birefringence of the layer, the examiner respectfully disagrees. The one directional rubbing the polymer film **is essentially a uni-directional stretching** of the film, for they provide the **same** result, namely causing the polymer molecules oriented in a specific direction, this essentially gives

rise the birefringent property. One having **basic** knowledge of material would understand that the molecules of the polymeric material are bonded to each other by the molecular force. By heating the material energy would be added to the molecules to help them free from the bonds and then ease the process of orientating the molecules. So by adopting the teachings of "stretching and heating" of polymer layer of Nakamura would certainly benefit the process of making the polymer layer to have good birefringence property, for the heating process frees the molecules for orientation. Furthermore, the birefringence of the polymer film of Takeda ('952) is the essential property for making the polarization beam splitter grating. It is certainly reasonable to try to apply the teachings of Nakamura to improve the making of birefringence layer of Takeda ('952) to improve the efficiency of the polarization beam splitter grating.

15. In response to applicant's arguments concerning the METHOD step of using an adhesive layer to attach the birefringent layer to the transparent substrate, the applicant being one skilled in the art must know the concept of using an adhesive to attach element A to element B and therefore improving the adhesion of the two elements are not a novel method that invented by the applicant rather it is common knowledge not only to the ordinary skill in the art but to ordinary people. There is no novelty in relying on such common knowledge.

16. In response to applicant's arguments concerning the different cited references are **intended** for different purposes (such as polarization beam splitter etc) which therefore cannot be combined, the examiner respectfully disagrees. All of the cited references are concerning and based on the essential property namely the birefringence property. Whether they are meant to use the birefringence property to design a diffraction grating utilized for beam splitting or polarizer, they are based on the same birefringence property and the grating structure. The intended use does not prevent one skilled in the art to extract the basic disclosure concerning the birefringent property of the layer.

17. In response to applicant's argument questioning the cited Takeda ('952) reference teaches a polarizing beam splitter with grating structure that is suitable for any birefringent layer, the examiner wishes to point the applicant, who is skilled in the art, to study the disclosure that the Takeda to understand the grating structure is designed to be suitable for ANY birefringent layer having refractive indices (n_e/n_o) (please see all of the figures). The polarization beam splitter is based on this birefringence and the grating structure alone and NOT on how and what birefringent layer is being prepared or used.

18. In response to applicant's arguments concerning the temperature used for the heating process, the applicant being one skilled in the art must understand the concept of try and error in a laboratory to obtain the most optimum temperature range for the heating process to obtain the optimum condition for preparing the birefringent layer.

19. In response to applicant's argument concerning the formula recited in claims 40 and 41 are not met by the Takeda ('952) the examiner respectfully disagrees, since the isotropic layer can be an overcoat layer (20) as shown in Figure 12 of Takeda ('952).

20. In response to applicant's argument concerning the formula recited in the Iwatsuka reference, that does not meet the formula recited in the instant application, the examiner respectfully disagrees. Judging from the disclosure in columns 4-5, the equations [(n1+) -(n2)]*d = N1* λ and [(n1-) - (n2)] *d =(N2+1/2)* λ, λ being the wavelength. Equation [IV} has a misprinted that is lacking the factor λ. But judging the derivation of the equations in column 4, the factor "λ" should be in equation [IV]. By identifying (n1+) being "np" and (n1-) being "ns", and "n2" being "n1" then the equations are the same as the formula in claims 48 and 49. **It is not clear what does it mean by "manipulating the equations", but being one skilled in the art the applicant must understand that the equations recited in the cited references are the same as the instant application and is the only condition that a polarization sensitive diffraction can occur.**

Conclusion

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (9:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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